

Vietnam's vanishing wildlife: the new threat of climate change

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ABSTRACT

Climate change represents a serious threat to Vietnam, to its protected area system and to the preservation of its biodiversity. The country is recognised as being one of those that will be most effected by climate change. It also contains significant biological diversity (10-16% of the world's species) and the second highest number of globally threatened species in mainland South-East Asia. Due to sea level rise alone, a significant amount of Vietnam's protected areas will be directly impacted suggesting a need to review the long term comprehensiveness of the protected area network. A 1m rise will put 22% of Nature Reserves, 39% of National Parks and 50% of wetlands at very high risk of inundation. In response to this and the additive effect of extreme events and other aspects of climate change, species will need to adapt, move or they will die out locally. Movement of species to track changing conditions and habitat may be possible in mountainous areas, but there would be significant barriers to north-south migration in the narrow, densely populated coastal corridor. However, the most pressing threats to Vietnam's wildlife are occurring now, and are hunting, the illegal wildlife trade, illegal logging and infrastructure development. Conservation of Vietnam's biodiversity requires international support to address both the existing challenges as well as those predicted for the future.

Key words: Climate change, wildlife, biodiversity, protected area, Vietnam

Introduction

Vietnam has been identified as one of the countries that faces the greatest changes to globally threatened habitats and to endemic species-rich habitats in protected lands (World Bank 2010a). It is one of the five countries most affected by climate change (Dasgupta *et al.* 2007) and is also one of the most disaster-prone countries in the world. In addition, it has a rapidly expanding population of 86 million people, a high growth rate (World Bank 2010b) and a population density of 253/km². Around 70% of its population depend on agriculture and around 19% live below the poverty line (Nguyen *et al.* 2010).

The impacts of climate change are already being felt in Vietnam. Over the last 100 years average temperatures have risen by 0.7°C – 1.5°C (January) and 0.3°C – 0.7°C (July), the frequency of tropical storms (typhoons) hitting Vietnam has risen by 2.6 per year and, in general, rainfall has decreased in the north and increased in the south (ISPoNRE 2009).

Predictions about future climate change in Vietnam (discussed in detail in the Vietnam Assessment Report on Climate Change, ISPoNRE 2009) based on the 2007 Intergovernmental Panel on Climate Change (IPCC) scenarios suggest that by end of the 21st Century the temperature will increase by 1.1 – 1.9 °C in the low emission scenario and 2.1 – 3.6 °C under the high emission scenario. Nationally, rainfall will increase by 1.0% – 5.2% under low emissions and 1.8% – 10.1% under the high emission scenario. For planning purposes the 'medium scenario' is the position recommended by Vietnamese government agencies (ISPoNRE 2009, MONRE 2009, and see critique by Fortier, 2010).

By 2100 the sea level is expected to rise by between 65cm and 1m (ISPoNRE 2009). The impacts of this are particularly severe for Vietnam (Dasgupta *et al.* 2007) partly due to its geography and the location of its population. The country is long and narrow with mountains to the west and a band of lowland plains and coastal fringe to the east. It has 3,260 km of coastline, two major deltas and thousands of rivers which have been modified by various embankments and dykes. Around 74% of Vietnam's population live on the coastal plains and the deltas that will be most affected by sea level rise (Carew-Reid, 2008). An estimated 85% of the sea level rise inundation will occur in the southerly Mekong River Delta region and 30-50% of land area will be inundated in half of the delta's provinces (Carew-Reid, 2008). Although less impacted, 36% of land area in the Red River Delta is less than 2.5 meters above sea level and low areas are dependent on sea dykes to prevent flooding (Nguyen *et al.* 2010). Impacts will vary by region but problems caused by extreme events such as droughts, floods and typhoons are expected to increase. While low-lying areas are directly impacted by typhoons, upland areas will face greater risks from flash flooding and landslides caused by heavy rain (see Chaudhry and Ruyschaert 2007).

Biodiversity

Vietnam is consistently identified as a priority in global conservation priority-setting exercises: it is included with the Indo-Burma 'Hyper-Hotspot' defined by Conservation International (van Dijk, *et al.* 2004); it contains all or part of six Global 200 Ecoregions identified by WWF

(2005); it contains seven Centres of Plant Diversity identified by the IUCN (Davis *et al.* 1995); and it contains all or part of five Endemic Bird Areas identified by BirdLife International (Tordoff 2002). Vietnam also has several globally important landscapes including the Lower Mekong floodlands Ecoregion, Central Highlands / Annamite mountains and the northern limestone forests (Baltzer *et al.* 2001).

Between 10-16% of the world's species occur in Vietnam and over 300 of these are globally threatened (IUCN 2006). Vietnam contains the second highest number of globally threatened species in mainland South-East Asia and 700 species are considered nationally threatened (Table 1). As a percentage, 25% of mammal species, 10% of bird species and 15% of reptiles species are nationally threatened. The introduction of new productive plants species, especially hybrids, are also replacing indigenous species and more than 80% of native crop varieties have been lost (Vietnam Environment Monitor 2005).

Threats to biodiversity

Vietnam's forests originally covered almost the entire country but were reduced to 28% coverage by 1990 (Vietnam Environment Monitor 2005). Over 2/3 of Vietnam's forests are now considered in poor condition, and closed-canopy forest accounted for less than 5% in 2004. Quality lowlands forests are almost eliminated (Vietnam Environment Monitor 2005) and between 1990 and 2000 the area of natural (high biodiversity) forest was reduced by over 50% (World Bank 2004).

On the coast, mangrove forests have been severely degraded. Between 1943 and 1999 they declined by 62% due to war and aquaculture, with aquaculture doubling in the decade up to 2001. In spite of active replanting for coastal protection, mangroves are still being lost at a rate of about 4,400 ha/year (MARD 2008). In the seas, corals have declined to 30% in some areas, and only 1% is considered to be in good condition (Vietnam Environment Monitor 2005).

Despite the development of an extensive protected areas system there is ongoing biodiversity loss in Vietnam. Protected area management boards have little authority when confronted with competing land and resource use pressures. Also, there are growing incentives to make protected areas pay their way leading to damaging road and tourism developments and even exploitative uses such as mining. This is driven by rapid population growth and increasing migration to biodiversity rich areas, land use changes triggered by demand for increased agricultural and for urban land use, and a high demand for wildlife products.

The immediate threats to biodiversity are (ranked in decreasing order) hunting for the illegal wildlife trade, infrastructure development (dams, reservoirs, roads, power stations, tourism and mining) and illegal logging/deforestation (WWF 2007). Factors contributing to the illegal wildlife trade include widespread rural poverty, low environmental awareness, a high demand for wildlife products both internationally and from the growing affluent urban population, weak governance and a low capacity of forest managers and protection staff.

Biodiversity conservation under climate change

Biodiversity conservation in Vietnam is especially dependent on protected areas, and these now cover 2.3 million ha or 7% of the country. There are 128 terrestrial protected areas and 68 nationally important wetlands, and of particular concern is the impact that sea level rise will have on these and key biodiversity areas. A one metre sea level rise is predicted (Carew-Reid 2008) to cause around 39% of National Parks and 22% of Nature Reserves to be inundated or at a very high risk of inundation. Around 50% of the 68 wetlands are also at very high risk with 28% predicted to be permanently flooded by the sea, in part or whole (Figures 1 and 2). Species located in protected areas that become inundated will need to adapt if possible, move or they will die out locally.

Categories of Species in Vietnam	Total Known Species (number)	Nationally Threatened Species † (number)	Percentage of Species Nationally Threatened	Species in Vietnam that are Globally Threatened ‡ (number)
Mammals	310	78	25	46
Birds (§Breeding)	840 (262)	83 (37)	10 (14)	41
Reptiles	296*	43	15	27
Amphibians	162	11	7	15
Fishes	3170	72	2	27
Invertebrates		72		NE
Plants	≈14000	309	2	148
Fungi		7		NE
Algae		9		NE

Table 1. The status of biodiversity in Vietnam, showing numbers of nationally threatened and globally threatened species for major animal and plants groups.

Information is taken directly from the Vietnam Environment Monitor 2005: Biodiversity: where † are based on Red Data Books of Vietnam (Anon 1992, Anon 1996, Anon 2000) and ‡ IUCN data 2004. NE = not evaluated. Additional sources of data derived from *Nguyen Quang Trung 2006, and §Earthtrends Country Profile 2003: Vietnam.

Sea level rise will occur incrementally and cause a permanent change. It is when this is combined with extreme events of greater intensity and regularity – storm surges, extreme tides, intensive local and upstream rainfall and extreme winds - that the full impacts will be most widely felt.

Protected areas in the surrounding 1-20 km zone of a new coastline are predicted to be at greater risk from storm surges, storms and floods and pressures caused by the displacement of millions of people. Twenty nine of

Vietnam's approved protected areas fall within this zone, including four national parks, 19 nature reserves and 13 cultural, historical and environmental sites. Protected areas outside the 20 km zone are expected to face increased pressure from people migrating from flooded and inundated areas. With this will come a suite of threats to the protected areas including encroachment, land conversion, poaching and illegal logging (Carew-Reid 2008). Other aspects of climate change will affect inland and upland biodiversity in ways not yet understood.

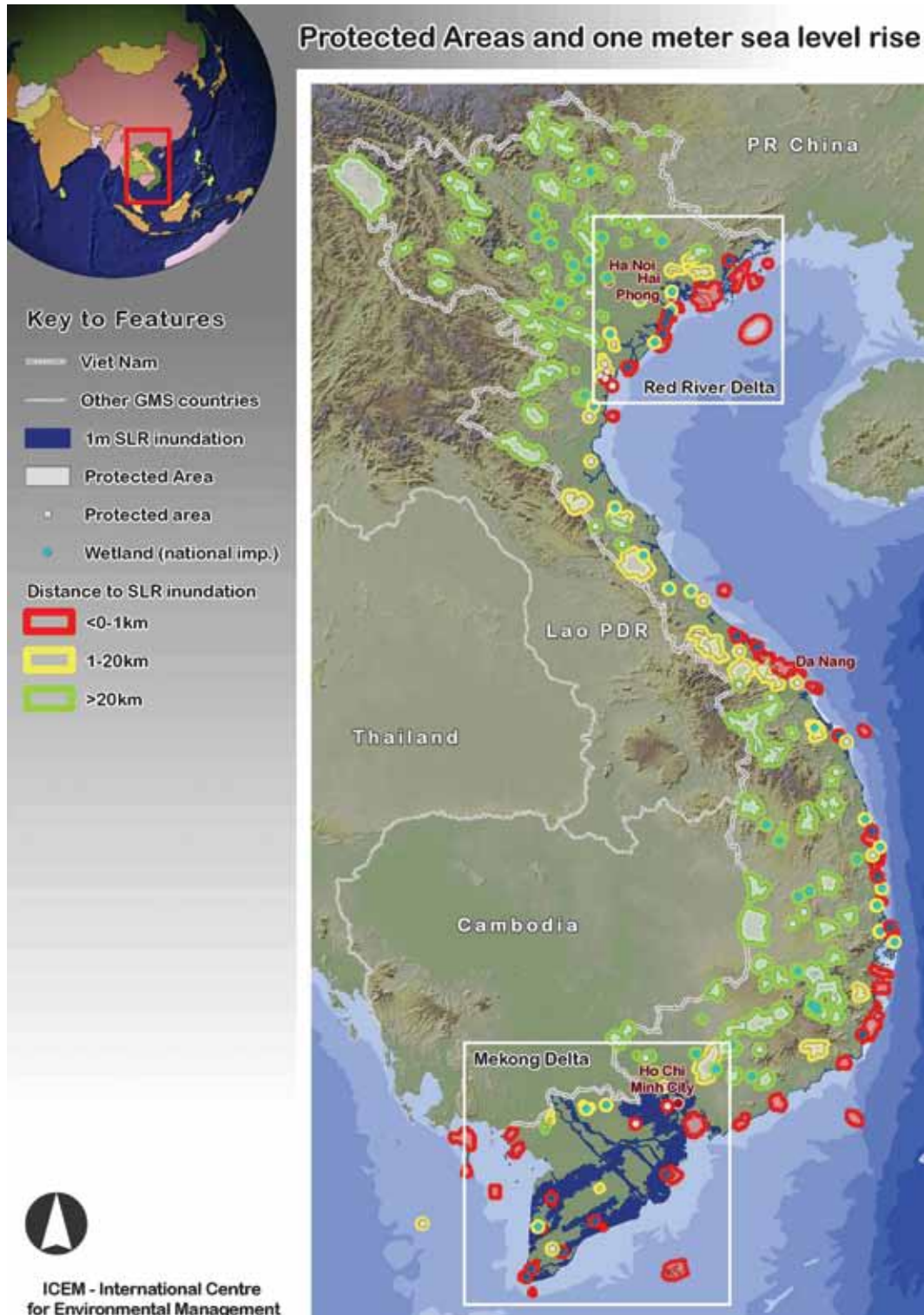


Figure 1. Protected area locations in Vietnam with the predicted level of inundation that would be caused by a 1m rise in sea level (SLR). Source: Carew-Reid, 2008.

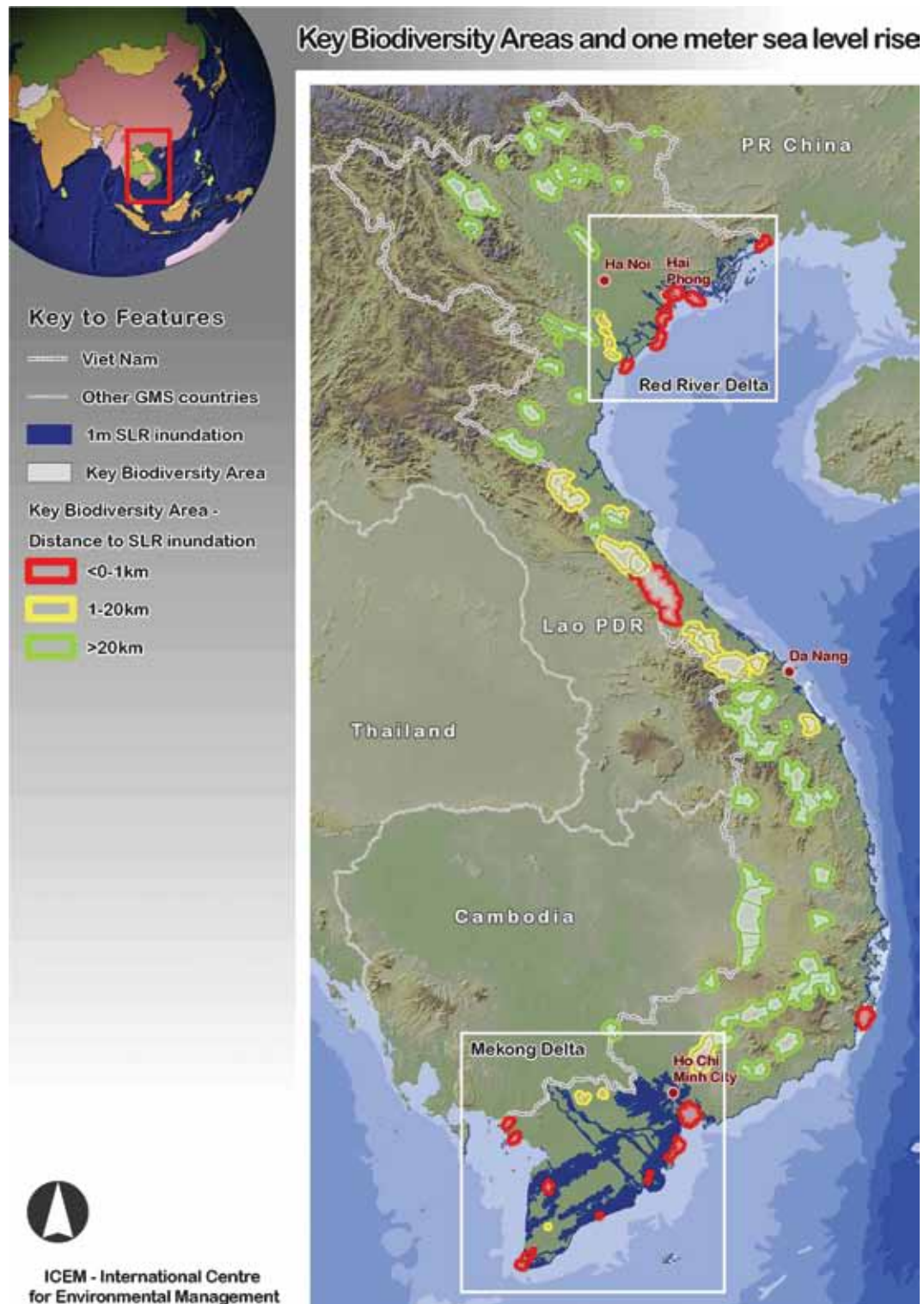


Figure 2. Key biodiversity areas in Vietnam with the predicted level of inundation that would be caused by a 1m rise in sea level (SLR). Source: Carew-Reid, 2008.

Under a changing climate wildlife species are expected to try to track their habitat as it moves with changing conditions. By the 2070s mountainous tropical trees in Vietnam could theoretically (see Booth *et al.* 1999) grow at an altitude 100-550m higher than present and occur 100-200km north of where they are today. The planting boundary for subtropical plants, however, would become narrower (ISPoNRE 2009). Plant and animal species located adjacent to intact elevated areas could shift a short distance to a higher, cooler altitude. However, some

lowland or coastal species will never be able to use the altitude option because their habitat-type cannot exist on a mountainside (e.g. a salt marsh, coastal swamp or floodplain). Those species will either need to move much further west or a long way north (or a mixture of the two) which is more problematic. In addition to the distance involved, the relatively narrow, densely populated coastal corridor contains north-south habitat bands that are highly vulnerable to fragmentation, disturbance and stochastic events.

Discussion

There are several reasons why Australian conservation scientists should be concerned about the impact of climate change in Vietnam. Of 55 migratory bird species using the East Asian-Australasian Flyway (Fig. 3), which includes Vietnam, 38 species regularly reach Australia (+15 vagrant spp.). Australia has obligations to protect these species under international treaties, and climate change may effect the integrity of the flyway and hence species survival. Vietnam is also a source of wild food crops, varieties of which may be needed to maintain food security in a changing climate. Additionally, some well-meaning development projects supported by international funds (e.g. infrastructure, power) may adversely affect biodiversity conservation in Vietnam by destroying remaining habitat or providing easier access. For example, a recent assessment of the environmental impacts of a proposed road in a National Park concluded that it would greatly increase the risk of illegal activity (hunting and logging). The road would bring within range of a days walk 60% of the parks area and 48% of its primary forest (Birdlife International & Chu Yang Sin Management Board, 2010).



Figure 3. East Asian-Australasian Flyway. Blue dots mark important waterbird sites in the flyway. Illustration: Maki Koyama © 2008 Partnership for East Asian-Australasian Flyway Partnership.

Ways in which Australia could help slow the biodiversity loss in Vietnam are by continuing to provide financial and technical support, especially to stop the illegal wildlife trade (see TRAFFIC, 2008), prevent illegal logging and to establish ex-situ conservation for threatened species (Fig 4.). Other goals could be to assist Vietnam implement management and law enforcement in existing protected areas, promote genuine ecotourism ventures with returns to the rural poor, promote effective co-management and assist with landscape planning to develop off-park management, corridors, buffers and transboundary parks.

Figure 4a-d. Some of Vietnam's endangered and protected species.



Figure 4a. A Sunda Pangolin *Manis javanica* confiscated from the illegal wildlife trade. Photo, Nguyen Van Thai, Carnivore and Pangolin Conservation Program.



Figure 4b. A Binturong *Arctictis binturong* skin at a market. Photo, Susan Rhind.



Figure 4c. The Fishing Cat *Felis viverrina*. Photo, N. Colquhoun.



Figure 4d. Two young Owston's Palm Civets *Chrotogale owstoni* bred as part of captive breeding program. Photo, M Turton, Carnivore and Pangolin Conservation Program.

Where Australia assists in policy development it is critical that improved recognition is given to the relationships between policies on climate change, disaster mitigation, biodiversity conservation and protected areas. The role of protected areas as a home to solutions to climate change, particularly as a buffer against its adverse effects (via mitigation and adaptation), is a new role for protected areas that is largely under appreciated. Strengthening the protected areas system is an obvious action that should be integrated into climate change policies.

The absence of connection between policies is partly historical as the two major international treaties about climate change and biological diversity arose independently. The 'Kyoto protocol' from the United Nations Framework Convention on Climate Change (UNFCCC, 1992) focuses on green house gas emissions and does not mention biodiversity, and the Convention on Biological Diversity (CBD, 1992) at the United Nations (UN) Conference on

Environment and Development focuses on biodiversity and does not mention climate change (Hodas 2008). This lack of connection means it is possible that policy adopted in one may conflict with or obstruct goals in the other. For example, mitigation measures may encourage carbon sequestration via monoculture afforestation and conversion of grasslands and wetlands into carbon plantations, but these will diminish biodiversity. Some of these problems were addressed in November 2010 when the Heads of Government and State of the General Assembly of the UN met specifically to ensure that measures to meet the objectives of the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change are mutually supportive and reinforcing.

Within Vietnam, The National Target Programme to Respond to Climate Change (MONRE 2008) and The Viet Nam Assessment Report on Climate Change (VARCC) (ISPONRE 2009) do contain explicit recognition of the impacts of climate change on biodiversity, particularly in relation to the forestry, agriculture and fisheries sector. Some of the recommendations for mitigation and adaptation are actions that will directly help protect biodiversity, however, the relationship between climate change and protected areas is less clear, with most references to protection relating to forests and mangroves. The newly endorsed (2010) Biodiversity Law (2008) does not mention climate change, but within it there are aspects that will help support species effected by climate change. For example, statements that there are needs for conservation areas, corridors, transboundary cooperation, control of invasive species.

The National Target Programme to Respond to Climate Change (MONRE 2008) provides the architecture for planning at all levels. This program is completing its first phase (2009 – 2010) and from 2011 will begin implementation. To date no protected area in Vietnam has had a climate change adaptation plan prepared.

Conclusion

Climate change represents a serious threat to Vietnam, to its protected area system and to the preservation of its biodiversity. In particular, a significant proportion of the country's protected area will be directly affected by sea level rise and related changes (Carew-Reid 2008). Recent modelling (Loarie *et al.* 2009) suggests that the climates of only 8% of global protected areas will have a residence time exceeding 100 years, so there is a need to review the future comprehensiveness of all protected area networks. However, the most pressing threats to Vietnam's wildlife are current, and are hunting, the illegal wildlife trade, illegal logging, and infrastructure development (Vietnam Environment Monitor 2005, WWF 2007). Conservation of Vietnam's biodiversity therefore requires international support to address both existing challenges as well as those predicted for the future.

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References

- Anonymous 1992.** Red Data Book of Vietnam, Volume 1 (Animals). Science and Technical Publishing, Hanoi.
- Anonymous 1996.** Red Data Book of Vietnam, Volume 2 (Plants). Science and Technical Publishing, Hanoi.
- Anonymous 2000.** Red Data Book of Vietnam. Animals. Science and Technical Publishing, Hanoi.
- Baltzer M.C., Nguyen Thi Dao and Shore R.G. (eds). 2001.** Towards A Vision for Biodiversity Conservation in the Forests of the Lower Mekong Ecoregion Complex. WWF Indochina/WWF US, Hanoi and Washington
- Booth, T. H., Nghia N. H., Kirschbaum M. U. F., Hackett C. and Jovanovic T. 1999.** Assessing possible impacts of climate change on species important for forestry in Vietnam. *Climatic Change* 41:109-126.
- Carew-Reid, J. 2008.** Rapid Assessment of the Extent and Impact of Sea Level Rise in Viet Nam, Climate Change Discussion Paper 1, ICEM – International Centre for Environmental Management, Brisbane, Australia.
- Chaudhry, P. and Ruyschaert, G. 2007.** Climate Change and Human Development
- Convention on Biological Diversity (CBD) 1992.** Secretariat of the Convention on Biological Diversity, Montreal, Canada.
- Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D. and Yan, J. 2007.** The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis. World Bank Policy Research Working Paper 4136, February 2007.
- Davis, S. D., Heywood, V. H. and Hamilton, A. C. (eds). 1995.** Centres of plant diversity: a guide and strategy for their conservation. Volume 2: Asia, Australasia and the Pacific. Cambridge, U.K.: IUCN Publications Unit.
- East Asian-Australasian Flyway Partnership.** www.eaaflyway.net/
- Fortier, F. 2010.** Taking a climate chance: A procedural critique of Vietnam's climate change strategy. *Asia Pacific Viewpoint* 51:229-247.
- Hodas, D. 2008.** Biodiversity and Climate Change Laws: A Failure to Communicate? Pp 383-399 in Biodiversity Conservation, Law and Livelihoods: Bridging the North-South Divide. Edited by M. Jeffery, J. Firestone, and K. Bubna-Litic. IUCN Academy of Environmental Law Research Studies. Cambridge University Press.
- IPCC 2007.** Fourth Assessment Report: Climate Change 2007. Working Group II: Impacts, Adaption and Vulnerability.
- ISPONRE 2009.** Vietnam assessment report on climate change (VARCC). Institute of strategy and policy on natural resources and environment. Institute for Strategy and Policy of Natural Resources and the Environment (ISPONRE) / UNER, Hanoi, Vietnam.
- IUCN 2006.** 2006 IUCN red list of threatened species.
- Loarie, S. R., Duffy, P. B., Hamilton, H. A., Gregory P., Field, C. B. and Ackerly, D. D. 2009.** The velocity of climate change. *Nature* 462: 1052-1055.
- MARD 2008.** Natural Disaster Management Plan to Mitigate Adverse Impacts of Climate Change. Ministry of Agriculture and Rural Development. Hanoi, Vietnam.
- MONRE 2009.** Climate change: Sea level rise scenarios for Vietnam. Ministry of Natural Resources and Environment. Hanoi, Vietnam.
- MONRE 2008.** The National Target Programme to Respond to Climate Change. Ministry of Natural Resources and Environment. Hanoi, Vietnam.
- Nguyen Huu Ninh, Luong Quang Huy, Le Thi Tuyet, Cao Thi Phuong Ly, Nguyen To Uyen. 2010.** The role of biodiversity in climate change mitigation in Vietnam: Red River estuary - Balat case study. Center for Environment Research, Education and Development. Hanoi, Vietnam
- Nguyen Quang Truong 2006.** Herpetological collaboration in Vietnam. Pp. 233-240 in Herpetologia Bonnensis II. Edited by M. Vences, J. Köhler, T. Ziegler, W. Böhme. Proceedings of the 13th Congress of the Societas Europaea Herpetologica.; 2006.
- Tordoff, A. W. (ed.) 2002.** Directory of Important Bird Areas in Vietnam: Key Sites for Conservation. BirdLife International in Indochina and the Institute of Ecology and Biological Resources. Hanoi, Vietnam.
- TRAFFIC 2008.** "What's Driving the Wildlife Trade? A Review of Expert Opinion on Economic and Social Drivers of the Wildlife Trade and Trade Control Efforts in Cambodia, Indonesia, Lao PDR and Vietnam". East Asia and Pacific Region Sustainable Development Discussion Papers. East Asia and Pacific Region Sustainable Development Department, World Bank, Washington, DC.
- United Nations Framework Convention on Climate Change (UNFCCC)** <http://www.cbd.int/doc/meetings/cop/cop-10/official/cop-10-27-en.doc>.
- United Nations Framework Convention on Climate Change (UNFCCC) 1992.** United Nations.
- Van Dijk, P. P., Tordoff, A. W., Fellowes, J., Lau, M. and Jinshuang, M. 2004.** Indo-Burma. Pp 323-330 in Hotspots revisited: Earth's biologically richest and most endangered terrestrial ecoregions. Edited by R. A. Mittermeier, P. Robles Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C. G. Mittermeier, J. Lamoreaux and G. A. B da Fonseca. University of Chicago Press.
- Vietnam Environment Monitor 2005:** Biodiversity. Joint publication of the Ministry of Natural Resources and Environment (MONRE), the World Bank and the Swedish International Development Cooperation Agency (SIDA).
- World Bank 2004.** Going, Going, Gone... The Illegal Trade in Wildlife in East and Southeast Asia.
- World Bank 2010a.** World Development Report – Development and Climate Change.
- World Bank 2010b.** World Development Indicators. <http://datafinder.worldbank.org/about-world-development-indicators>.
- WWF 2005.** List of Global 200 Ecoregions. <http://www.panda.org>
- WWF 2007.** Implementing Landscape Conservation for Ecoregion Conservation in Vietnam.